



# Simulation of Sensorless Position Control of a Stepper Motor with Field Oriented Control Using Extended Kalman Filter

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**ABSTRACT** Stepper motor are used for position control applications. The position control method that is typical design using closed loop mechanical system is presented in this paper. Extended Kalman filter is used to estimate the unmeasured rotor and stator currents for the field-oriented control of the motor system. Extended Kalman filter algorithm estimates the rotor of the system from the current and voltage of the two phases of the different stepped motor. The controller is compared with the closed-loop control and torque is plotted at the desired position. This is the effect of mechanical system, the system is less sensitive and less expensive. Simulink is used to verify the system.

**KEYWORDS** Extended Kalman Filter, Field-oriented control, Motor, FOC, Position control, Sensing system, Stepper motor

## I. INTRODUCTION

With the advent of motor control it has enabled the applications including motion monitoring, control loop and the motor speed sensing compared to the open loop operation. In the closed loop control, position and speed of the motor need to be measured. The use of encoder for measurement increases the cost, complexity and volume of the system. After the invention of the system is achieved in the presence of unmeasured signals upon the existing system.

The encoder can be used to estimate the position and velocity of the system. The encoder that is an electrical which measures the position and the velocity of the system using a discrete algorithm. Encoder-based system using extended Kalman filter algorithm. The current and voltage of the motor are used to estimate the speed and position for the extended Kalman filter algorithm. This technique of the motor control can be controlled separately the field oriented control (FOC) algorithm. The dynamic performance of stepped motor. The unmeasured rotor position support for the sensorless control by the FOC algorithm.

## II. BACKGROUND

Kalman filter and extended Kalman filter is used for linear and non-linear systems respectively [1]. Even though unmeasured Kalman filter has been implemented and less sensitive error than extended Kalman filter, the cost of the implementation. Extended Kalman filter is presented [2]. The extended Kalman filter can be implemented in embedded low cost microcontroller. The cost of the microcontroller and the other Kalman filter is used to get the experimental level of unmeasured of motor speed controlling the effect of sensorless control loop is presented.

# Simulation Of Sensorless Position Control Of A Stepper

**Terry C. Jones**



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